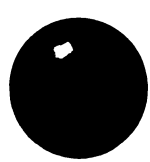
IntroCAD

Owners — Manual



PROGRESSIVE
PERIPHERALS
& SOFTWARE

IntroCAD

by Tim Moody

Published By:
Progressive Peripherals & Software Inc.
464 Kalamath Street
Denver, Colorado 80204

IntroCAD software written by Tim Moody.

IntroCAD documentation written by Tim Moody with thoughtful editorial assistance by Roy Brothwell.

Published by:
Progressive Peripherals & Software
464 Kalamath Street
Denver, CO 80204
Phone: (303) 825-4144

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IntroCAD Manual

1.0 Introduction to IntroCAD

1.1 Object Oriented Drawing

IntroCad is an "object-oriented" drawing program. Let me explain what that means by contrasting IntroCad with the "pixel-oriented" drawing programs with which you may be more familiar. The major difference, as you will see, is in the way information is stored.

Pixel-oriented programs (e.g., GraphiCraft™, DeluxePaint™, MacPaint™) store essentially all of the information which describes the picture you are drawing right on the screen in front of you. Each little dot on the screen—each pixel—has a color; your job, as drawer, is to change the colors of selected pixels.

For some purposes, the screen is not an ideal place to store picture information. A computer screen is a relatively low-resolution device when compared to most printers and plotters; you normally can't use the higher resolution of these output devices if the picture information is stored on the screen.

Some numbers: the highest resolution achievable on the Amiga is approximately 75 dots per inch (DPI) horizontally, by 60 DPI vertically (with the standard Amiga monitor). In contrast, the best resolution of one medium-priced dot matrix printer is 240 by 216 DPI. Laser printers routinely achieve 300 by 300 DPI.

Object-oriented programs, on the other hand, store information in a drawing list which is kept in the computer's memory and use the screen only to exchange information with you. The screen is optimized for quick transmission of information to your monitor, while the drawing list is optimized for faithful recording of your drawing. Your job, in using an object-oriented program, is to "tell" the program where the lines which make up your drawing begin and end, what color the lines are,whether they are solid or dashed, etc. You tell IntroCAD these things by drawing the objects, just as if you were using a pixel-oriented program. The program responds by showing you a picture of what you're drawing.

In Intro-CAD, what actually is stored are the points of the objects you draw. A line segment, for example, is stored simply as two points—two pairs of coordinates.

IntroCad can use the full resolution of any output device it knows how to talk to because the picture information is stored in a drawing list rather than on a screen. IntroCad could effectively use an output device with a resolution of well over one million dots per inch, (although no such device exists, nor is one likely to become generally available in the near future). This ability is one major advantage enjoyed by object-oriented drawing programs.

A second difference between object-oriented and pixel-oriented drawing is the way they behave when you draw one object on top of another. In pixel-oriented drawing, the covered object is gone forever; all memory of it has been erased and replaced by the new object. (But most pixel-oriented programs provide a means of recovering the obscured object by "undoing" the drawing motion which erased it.) In object-oriented drawing, nothing is ever erased by drawing on top of it; objects are remembered unless they are explicitly erased.

The biggest difference becomes clear when you begin to modify a drawing. Let's say you have drawn a box on the screen and then, later, drawn a circle overlapping it. An object-oriented program allows you to move the box, or modify its shape without changing the circle in any way. Normally, you can also group the box and circle together and move or modify them as a unit. A pixel-oriented program normally doesn't allow you to move or modify overlapping objects separately. Instead, you modify sections of the screen—with whatever objects, or parts of objects happen to lie on those sections.

In pointing out some of the advantages of object-oriented drawing, I don't mean at all to represent it as "better" in any absolute sense than pixel-oriented drawing. It simply is different, with different advantages and disadvantages. A major disadvantage of object-oriented drawing, for example, is that the drawing list grows, consuming more memory as more objects are drawn. A very complex drawing may not fit in your computer's memory space. In contrast, a pixel-oriented drawing always takes up the same amount of memory—regardless of the drawing's complexity.

1.2 Drawing with IntroCAD

If you've never used a drawing program before, or if you've only played around with one for a few minutes, you may feel that you are lacking some basic information—that you should read this manual through before trying to use IntroCAD.

Not true. You should dive right in. You don't need to know all the ins and outs before starting to draw. In fact, it's probably not even a good idea: You might find that you learn faster if you learn a little at a time just enough to actually *do* something new—and cement your new knowledge by using it.

Here's how to draw some simple objects with IntroCAD:

Box:

Select "Box" from the "Draw" menu. Position the mouse pointer where you want one corner of the box to be. Click the left mouse button once. Move the mouse pointer until the box you see is the box you want. Click the left mouse button once.

So you see what's going on here: Your first mouse click puts an imaginary pen down on the page; your second one picks it back up and makes the box part of your drawing. (All that hideous stuff—about coordinates of points being somehow entered into a drawing list—you might have imagined while reading the "Object-Oriented Drawing" section has just been done for you. You can think about the box; IntroCAD will take care of the drawing list.)

Circle: Much like drawing a box.

Select "Circle" from the "Draw" menu. Position the mouse pointer where you want the center of the circle to be. Click the left mouse button once. Move the mouse pointer until the circle you see is the circle you want. Click the left mouse button once.

Line: This one's a little different.

Select "Line" from the "Draw" menu. Position the mouse pointer where you want the line to begin. Click the left mouse button once. Move the mouse pointer until the line you see is the line you want. Click the left mouse button *twice* (don't move the mouse between clicks).

Why do you have to click twice to end a line? Because the "Line" tool is also used to draw a set of connected lines. A single click with this tool means "end this line and start another." There's a limit to the number of connected lines you can draw at once, but you'll probably never reach it. For concreteness, here's an example of two connected lines:

Set of two connected lines:

Select "Line" from the "Draw" menu. Position the mouse pointer where you want the line to begin. Click the left mouse button once. Move the mouse pointer until the line you see is the line you want. Click the left mouse button once. Move the mouse pointer until the line you see is the line you want. Click the left mouse button twice (don't move the mouse between clicks).

Arc: Like a circle, but with one extra click.

Select "Arc" from the "Draw" menu. Position the mouse pointer where you want the center of the arc to be. Click the left mouse button once. Move the mouse pointer to set the radius and starting angle of the arc. Click the left mouse button once. Move the mouse pointer until the arc you see is the arc you want. Click the left mouse button once.

Text: Just as you might expect.

Type a letter at the keyboard. That's it. (You can do this at any time. You never need to make a menu selection before typing text into your drawing.)

You can set the text size very simply:

> Select "TextSize" from the "Draw" menu. Draw a box. (It doesn't matter where you draw the box; only its size matters.)

You can set the text location very simply as well:

> Select "Cursor" from the "Draw" menu. Position the mouse pointer where you want the lower left hand corner of the next letter to begin. Click the left mouse button once.

1.3 IntroCAD's Screen

There are a number of features IntroCAD can put on the screen on top of your drawing. All of these are intended to give you information of one sort or another. All are controlled by selections from the "Options" menu.

Rulers

These are the numbered bars which occur at the left and bottom edges of the screen. The rulers are marked out in inches. You can toggle display of the rulers with the menu item "Rulers."

There is nothing special about the screen regions occupied by the rulers. You can (and should not hesitate to) draw right on top of them. IntroCAD normally doesn't bother to refresh the screen when the rulers are scribbled on because this can happen frequently and, for a complex drawing, a screen refresh can take several seconds. You can, however, cause IntroCAD to refresh the screen each time the drawing changes by selecting the menu item "ReDraw/Auto" ("Auto" is a sub-item of "ReDraw") from the "Options" menu.

Grid

These lines are drawn behind your drawing. You can choose from several different kinds of grid. You can also make the grid invisible. The menu item "Grid" is used for these selections. You can make the grid mesh finer or coarser with the menu item "Grid Mesh."

Current Tool

At the upper left-hand corner of the screen, IntroCAD prints the abbreviated name of the *tool* you are currently using. (Examples of tools are the "Line" tool, with which you draw lines; the "Erase" tool, with which you erase objects; and the "Group" tool, with which you group objects together.) Display of this feature is controlled with the menu item "ShowTool."

Coordinate Readout

When the menu item "ShowXY" is active, IntroCAD prints four numbers at the lower left-hand corner of the screen. The display might look like this:

10.00:2.25 2.00:5.50

The first two numbers in the display are the current X (horizontal) and Y (vertical) coordinates of the mouse pointer. The other two numbers are the X and Y distances from the pointer to the position of the most recent SELECT click.

Free Memory

When the menu item "ShowMem" is active, IntroCAD prints the total amount of computer memory which has not been allocated by any process. The display occurs near the middle bottom of the screen. The number is in kilobytes.

Grid Spacing

While a "Plain" or "Projection" grid is selected, IntroCAD prints the spacing between grid lines at the lower right-hand corner of the screen.

1.4 IntroCAD Objects & Groups

In this manual, the words OBJECT, GROUP, and PRIMITIVE will occur frequently. These words have special meanings here; they refer to parts of your drawing.

To IntroCAD, an ***OBJECT*** is either of:

1) The result of a single complete drawing motion. A box, for example, is an object. So is a set of connected line segments all drawn "at the same time." So are circles, letters, etc. These objects are also called ***PRIMITIVE***s.

2) A grouped set of primitives. Such an object is also be called a ***GROUP***. There is no limit to the number of primitives in a group, or to the number of groups in a drawing.

A few notes about groups:

The grouping of objects need not be permanent. You can dismember ("UnGroup") a group into primitives at any time. IntroCAD doesn't ever change the group structure of a drawing on its own, however. When a drawing is saved to disk, the group structure is saved with it.

No object can be in more than one group at a time. If you try to group objects which already belong to different groups, IntroCAD will assume you want to unite them all into a single group.

Although they can be brought together, groups are not hierarchical. In other words, IntroCAD does not keep track of groups within groups. When a group is "UnGrouped," the result is always a collection of primitives.

It is not an error to attempt to ungroup a primitive. (It doesn't work, though.)

2.0 Control Concepts

2.1 The Mouse

In IntroCAD, the mouse does mostly what you're accustomed to from drawing programs like GraphiCraft. There are a few differences, however: (Here, and throughout this manual, the "SELECT" button is the left mouse button; the "MENU" button is the right mouse button.)

1) In IntroCAD, you are called on to select objects, (e. g., for treatment with one of the editing tools). Since IntroCAD can't know for which of two or more overlapping objects your SELECT click was intended, it runs through a list of all the possibilities, highlighting each in turn. In this context,the MENU button means "No, not that one," the SELECT button means "Yes, the highlighted object is the one I want." (See "Selecting & Highlighting.")

2) While editing or drawing an object, IntroCAD gives you a chance to abort the whole operation. In this context, the MENU button means "Abort" and the SELECT button means "The highlighted object is drawn as I want it, make it permanent." The only exceptions to this rule are text and coloring, setting line type and rotating by 90 degrees.

3) Certain editing functions, "Point" for example, require additional information and indicate this by drawing highlighted objects. You are asked to click on (SELECT button) e. g., one of the objects.

4) In certain circumstances, IntroCAD prompts you for a mouse motion by making a suggestive little pictogram with the mouse pointer. The meanings of the pictograms are as follows:

A) Circle with a slash through it:

Wait. IntroCAD is busy with some calculations and is not looking for input from you. However, Intuition—the Amiga's user interface—is *always* attentive to the mouse and keyboard and will "stack up" mouse clicks and key presses for later handling by IntroCAD. You should not assume, then, that the mouse and keyboard are ignored while the "Wait" pointer is displayed.

B) Arrow with a queston mark:

This is a "Select Something" mouse pointer. Point at something and click the ***SELECT*** button. Typically, you will position the mouse pointer over some object on the screen and click to direct IntroCAD's attention to the object.

C) Arrow with a box:

This is a "Draw Region" mouse pointer. Draw a box. (For "zooming" only, clicking twice in the same spot is equivalent to drawing a box twice the size of the screen. See "Zoom" in the section which describes the "Options" menu.)

D) Question mark with a "y" on the left and an "n" on the right:

This is a "Yes/No" mouse pointer. Say "Yes" by clicking the SELECT button, or "No" by clicking the MENU button.

So, generally, when the mouse buttons don't have their Intuition meanings, the SELECT button means "Yes/THAT one/Do it," and the MENU button means "No/Not THAT one/Get me out of this!" This follows the generally accepted convention that "left" breaks new ground while "right" is conservative and safe. If you get lost in, or called away in the middle of, a sequence of mouse clicks, a couple of MENU button clicks will ALWAYS get you out of it.

One last thing. Since IntroCAD appropriates the MENU button for things like selecting objects and aborting, there are times when you can't (immediately) make menu selections with this button. If you truly do want to make a menu selection and IntroCAD seems uncooperative, just click the MENU button until the menu bar flashes at the top of the screen, and then make your menu selection.

2.2 Selecting Objects

To edit, clone, or save an object, you must first specify the object by selecting it. (This is true even if there is only one possible object). There is no explicit tool for this purpose since IntroCAD always knows when a selection is required. At the appropriate time, IntroCAD will ask you to specify an object by giving you the "Select Something" mouse pointer (an arrow with a question mark above it).

When IntroCAD gives you the "Select Something" mouse pointer, you should point to the object of your choice and click the SELECT button. IntroCAD will make a list of all the objects you might possibly be referring to. We can call this list the "Select List." IntroCAD will "highlight" the first one in the list by causing its color to "cycle" (change continuously) and give you the "Yes/No" mouse pointer. If the highlighted object is the one you want, say "Yes" by clicking the SELECT button; if not, say "No" by clicking the MENU button and IntroCAD will highlight the next object in the list. If you get all the way through the Select List without saying "Yes" to any of the objects, IntroCAD will invite you to make another selection by again giving you the "Select Something" mouse pointer. You can, of course, ignore the invitation and make a menu selection instead. It may help you to know how IntroCAD infers, from your first SELECT click, which particular object(s) you want to specify. For each primitive object, IntroCAD maintains a "region rectangle." This is the smallest rectangle—with horizontal and vertical sides—which completely encloses all points of the primitive object. (A vertical line, then, has a region rectangle one pixel wide. You can't be that precise? OK, IntroCAD actually allows a little slop here). If your click lands in an object's region rectangle, that object goes into the Select List. If the object is part of a group, the whole group goes into the list (as one object).

There is a potential problem with this method of selecting objects: What if you draw, for example, a circle with some objects inside it, and then zoom inside the circle so that none of it is visible on the screen? If you now try to select one of the objects inside the circle, your SELECT click can't help but be inside the circle's region rectangle. IntroCAD will dutifully include the circle in the Select List, and highlight it in its turn. Although you won't be able to see the highlighted circle because its off-screen, but IntroCAD will not know this. Your job is to say "No" whenever you get the "Yes/No" mouse pointer and don't see a highlighted object.

3.0 IntroCAD & AmigaDOS

3.1 Files and Directories

There is more to IntroCAD than the single executable file called "Intro-CAD". There are several other files, and sub-directories which should or must be in the directory which contains the "Intro-CAD" file. The idea behind this separation into multiple files is to give you some ability to customize IntroCAD and to adapt it to printers and plotters—it is an admission that we don't know as much as you know about how you want your program to operate.

But there is a (one-time) cost to you in this approach we have taken: it makes copying IntroCAD to, say, a hard disk a little harder. Here's the easy way to do it right:

Let's assume, for example, that you want to copy IntroCAD from the disk in DF1: to a subdirectory on your hard disk called "DH0:graphics/cad". We have to get into the CLI and type some commands.

If the subdirectory doesn't already exist, we need to:

```
MakeDir DH0:graphics/cad
Copy DF1:Drawings.info DH0:graphics/cad.info
```

Let's make an assignment to save some typing:

```
Assign DEST: DH0:graphics/cad
Copy DF1:Intro-CAD#? DEST:
MakeDir DEST:Drawings
Copy DF1:Drawings.info DEST:
MakeDir DEST:Parts
Copy DF1:Parts.info DEST:
MakeDir DEST:PrtDef
Copy DF1:PrtDef.info DEST:
MakeDir DEST:PltDef
Copy DF1:PltDef.info DEST:
Copy DF1:PltDef DEST:PltDef
Copy DF1:PrtDef DEST:PrtDef
Assign DEST:
```

3.2 Description of IntroCAD files

Intro-CAD
Intro-CAD.info

This is the executable program and its icon.

Intro-CAD.rgb

This is a text file which contains the colors IntroCAD uses for its screen. When you select "Save Colors" from the "Palette" menu, IntroCAD writes this file. We didn't want to force our color choices on you by building them into the executable file. Saving the colors with each drawing file also didn't seem like a good idea for the following reason: Users with a color printer or plotter will probably want at least part of the color palette to closely approximate the colors available on those devices. Each time these users created a new drawing, they would have had to set the palette up by hand, or read in an existing drawing just to get the color palette.

Intro-CAD.txt

This is a text file which contains the "font" IntroCAD uses to draw letters into your drawing. This is NOT an Amiga font! Again, it would have been easier to make this part of the executable file, but then what about the user who is able to design a nicer font than ours? Also, what

about the user who wants to use IntroCAD to, say, lay out mathematical equations? Admittedly, this file is not very easy to write or modify, but some users would be unhappy if the option didn't exist.

Intro-CAD.title

This is IntroCAD's title screen. It's a big file. If we made it part of the executable file, the memory it occupied would be unavailable to you. But since it's an external file, that memory can be released as soon as the title screen goes away.

One function of a program's title screen, by the way, is to aid the author in protecting his right to sell the program. There are many other ways, of course, including copy-protection, dongles, etc. Users typically object to these, and we aim to please. You must allow us ***some*** degree of protection, however. We must at least have some way of telling people—without any possibility of misunderstanding—that IntroCAD is a commercial product, not a public-domain program that they may copy and distribute to their friends.

Drawings

On startup, IntroCAD assumes that Drawings can be found and stored in this directory. This is intended purely as a convenience to you. If this directory doesn't exist, IntroCAD will at first think you have the wrong disk, but will accept any alternative directory you specify. The idea here is to make it unnecessary for you to wade through files which aren't Drawings when you use the file requester.

Parts

On startup, IntroCAD assumes that Parts can be found and stored in this directory. Likewise intended as a convenience to the user, this feature means that if this directory doesn't exist, IntroCAD will be momentarily confused (as with the "Drawings" directory). The idea here is to make it easy to keep Parts separate from Drawings, and to make it easy to move a bunch of Parts all at once from one disk to another.

PrtDef

This directory contains "Printer Definition" files. One such file contains all the information needed by IntroCAD to render a drawing on a particular printer. On the original IntroCAD disk, there are many such files but, typically, a user will want only the few that describe printers to which he or she has access. All other files should be deleted from your WORKING COPY of the IntroCAD: disk.

Since most users heavily use only one printer, a mechanism exists for establishing a default printer. Simply rename the desired Printer Definition file as "DEFAULT_PRINTER". IntroCAD initially assumes the file you want to use has this name.

PltDef

This directory contains "Plotter Definition" files. These are used in much the same way as Printer Definition files. The one which describes the plotter you use most should be renamed "DEFAULT_PLOTTER". (If you never intend to use a plotter, you don't need this directory).

4.0 First Time Through (A Short Tutorial)

This section is an introduction to some IntroCAD features. Not all features are covered here. Neither are the covered features described in extensive detail. The idea here is to give "The Big Picture" very quickly and painlessly to users who dislike formal tutorials.

Some people like detailed move-by-move instructions and some don't. If you're one who does, go through the section of this manual called "Drawing with IntroCAD." The basic drawing motions are described in that section. Another place to go for more detail is the section called "Menus.")

4.1 Backups

IntroCAD is not copy protected in any way. Make a copy of the IntroCAD disk and put the master copy in a safe place. If you are not sure how to copy a disk, refer to your "Introduction to Amiga" manual. Make sure the copy is named "Intro-CAD" (not, for example, "Copy of Intro-CAD"; also, not " Intro-CAD"—with a leading space).

4.2 Loading IntroCAD

From the WorkBench:

There are three methods:

1) Double-click on the IntroCAD icon.

2) Press and hold the shift key. Click on the icon of a Drawing. Double-click on the IntroCAD icon. Release the shift key.

This will open IntroCAD and cause it to also open the Drawing you selected.

3) Double-click on a Drawing's icon.

This will do the same thing as method #2, and is a nice short-cut, but this method requires:

a) that "Intro-CAD" hasn't been renamed.
b) that "Intro-CAD" is located in the top drawer of a disk (also) named "Intro-CAD".

In other words, IntroCAD's FULL name must be "Intro-CAD:Intro-CAD". Experienced users sometimes call the part up to and including the colon the "path," while the rest is the "name."

If you've copied IntroCAD to a hard-disk or ram disk, you can't cause the path to be "Intro-CAD:", but you can do the next best thing: Say, for example, you've copied IntroCAD to the directory "DH0:cad". You can open a CLI window and type:

```
Assign Intro-CAD: DH0:cad
```

From now until you re-boot the machine or turn it off, the WorkBench will act as though IntroCAD were located on a disk named "Intro-CAD".

Loading IntroCAD from the CLI:

You must first set the stack to 10000 or more. Next, type

Intro-CAD [RETURN]

or

Intro-CAD filename [RETURN]

where filename is the name of a drawing or part file that you want to create or edit.

4.3 The Drawing Environment

Get comfortable with your drawing environment. Play around with the tools from the "Draw" menu until you have some "stuff" on the screen (forget "TextSize" and "Cursor" for now). You might have a hard time guessing that the only way to "end" a line is to click twice in the same spot. Make a few selections from the "Options" menu and see what they do.

4.4 Screen Manipulation

A) Slide:

Learn how to "drive" around in your drawing. Select "Slide" from the "Options" menu and draw a line with the mouse. When you've finished the line the picture will move in the direction of your drawing motion. There is practically no limit to how far you can "Slide" a picture.

B) Zoom:

Select "Zoom" from the same menu. The mouse pointer should now be an arrow with a box above it. IntroCAD is asking you to draw a box (a "zoom region"). The picture will expand to show you the region inside the box you drew. (There is a limit to how far you can zoom in; the lines in your drawing may begin to look a little funny when you've reached it). You can "zoom out" by clicking twice in the same spot instead of drawing a box.

C) FullPict:

Select "FullPict." IntroCAD immediately zooms out so that the entire drawing is displayed.

D) ReDraw:

Select "ReDraw." IntroCAD refreshes the screen without zooming.

4.5 Text

A) Keyboard Entry:

Text is plotted simply by typing at the keyboard. Be aware that the keyboard is active even when other tools have been selected. Type a couple of letters. If no letters appear on the screen, do a "FullPict." Tab, Backspace, Del, and Return do nearly what one would expect. Backspace does not erase, however, Del does. Return moves the text cursor to one line below the most recently specified cursor position.

B) Cursor:

You can choose the location of the next character with the "Cursor" tool from the "Draw" menu. Select that item and click somewhere on the screen.

C) TextSize:

You can choose the character size with the "TextSize" tool, also from the "Draw" menu. Notice that "Cursor" and "TextSize" do not affect text already drawn. You will use the "Edit" menu for that. On startup, IntroCAD calculates a default text size as a fraction of the drawing size. This means that the text size is not likely to remain constant from one IntroCAD session to another. The text size doesn't change *during* a session, however, unless you change it.

D) The Del Key:

The Del key isn't picky about what it erases. It simply finds the last primitive object in the drawing list and kills it. The object may or may not be a letter; Del backspaces the text cursor regardless.

Some letters (like the "equals" sign) are actually made of two primitive objects. Del erases only one of them, but backspaces the text cursor as if both had been erased. Try the delete key now. Notice that this key deletes the primitive object most recently drawn, whether or not that object was text.

4.6 Editing

Select "Erase" from the "Edit" menu. The mouse pointer should now be an arrow with a question mark above it. IntroCAD is asking you to select an object by clicking on it. (For now, an object is the result of a single drawing motion. Soon, you'll learn how to group objects). Once you've selected an object, IntroCAD will "highlight" it. By changing the shape of the mouse pointer, IntroCAD will ask whether this is the object you had in mind. Click the left mouse button for "Yes" and the object will be erased. If you click the right button instead, IntroCAD will highlight another object if there is one nearby. If not, the menu bar will flash at the top of the screen, telling you that menu selections can now be made. At this point, you can select another object, or another tool from the menu.

All of the editing tools begin work in the same way: you first select an object, then confirm your selection. But with some of the editing tools, there is more. Try the "Move" tool. Maybe you can guess how to use this one.

4.7 Cloning, Parts

Although "Clone" is an item in the "Draw" menu, it *feels* to your hand like an editing tool: it *feels*, in fact, exactly like the "Move" tool. Try it. You like? This is probably going to save you a LOT of time.

Sooner or later you're going to wish you could somehow Clone and re-use an object you drew in some other IntroCAD session—so that

you can include it in your current drawing without having to draw it all over again. Well, you can, but we don't use the word "clone" to describe the process.

Select "Open" from the "Part" menu. You will get a file requester. The names listed are names of Parts—which live on disk. Click on one of the names and then click on the "OK" gadget of the requester. Now your situation is EXACTLY as it would be if you had selected an object in your drawing using the Clone tool, but the object hanging off the end of your mouse pointer came from disk.

When you've drawn an object you can't bear to part with, save it as a Part: select "Save As" from the "Part" menu and select the object you want to save (as if you were planning to use an editing tool on it). A file requester will come up. Type the name you want the Part to be called and click the "OK" gadget. The object will be written to disk.

In case you were wondering... Yes, you can include an entire Drawing in your current drawing by Opening it as a Part.

4.8 Groups

This is advanced stuff, but it's particularly easy to use. You will probably come to use groups a lot in drawing and editing.

Select "Group" from the "Part" menu and draw a box completely around several objects. The enclosed objects are now grouped (and will stay grouped until you ungroup them with the "UnGroup" tool). You can now treat the group of objects as a single object. You can apply any of the editing tools to this object. You can also clone the object.

What if you group objects, some of which are already in different groups? The groups merge into a single group; no object can be in more than one group at a time.

4.9 Snapping

A) Introduction to Snapping:

Let's face it; most folks couldn't draw a straight line or a right angle to save their lives. This is why rulers and graph paper

were invented. IntroCAD allows you to superimpose a grid on your drawing, but so far,you've seen nothing which actually helps you align your drawing with the grid. Now you are NOT going to slap a ruler up to a computer screen to help you draw, and so we have the basic motivation for "snapping." Snapping corrects your drawing motions, either while you are drawing or after the fact. (Also, snapping is optional; IntroCAD never snaps unless you tell it to).

There are two very different kinds of snapping. The main difference is the information used to decide where a drawn point SHOULD have been drawn. Another way to say this is that there are two possible "destinations" for a point which is to be snapped: it can snap to the nearest grid intersection, or it can snap to one of the already existing points of your drawing. I'll say, for example: the "snap destination is 'Grid'" or "the snap destination is 'Drawing,'" or "no snap destination is set." If no snap destination is set, no snapping will occur.

When the snap destination is "Grid," the grid intersections become very "attractive." Snapped lines, for example, will begin and end at the grid intersections. When the snap destination is "Drawing," the grid is irrelevant. Instead, the existing drawing becomes moderately attractive. If a line, for example, begins within a few pixels of an existing line or point,when snapped it will begin exactly at that line or point. (Points are more attractive than lines).

There are two menu items associated with snapping. The "Options" menu item "Snap to" selects the snapping destination. The "Edit" menu item "Snap" allows you to snap an existing object to the current snapping "destination."

B) Snapping to the grid:

Select a grid type from the "Options" menu. Select the drawing option "Snap to Grid" and draw some stuff. Notice that circles and arcs aren't snapped point-by-point while drawing, and that text is not snapped at all. Also notice that grid snapping is suspended whenever you aren't actually drawing anything; when grouping objects, for example.

C) Snap Naively:

Select the editing tool "Snap Naively" and apply it to a couple of different objects. Notice that EVERYTHING, even text, snaps point-by-point when this tool is applied. This is a DANGEROUS TOOL!

D) Snap No Distort:

Select the editing tool "Snap No Distort" and apply it to several objects. (This tool used in much the same way as the "Point" edit tool). This tool is much safer than "Snap Naively."

E) Snapping to the drawing:

Select "Snap to Drawing" from the "Options" menu. Draw a line which begins very near an existing object, and see if the line gets snapped. You'll probably use it rarely but, when you need it, there is no substitute.

Hopefully you now have a general idea of how to use IntroCAD. From here, I suggest you "wing it," referring as necessary to the tool descriptions in the "Menus" section.

5.0 Menus

Some menu items in IntroCAD are *tools* and some are just Regular Old Menu Items (R.O.M.I). It isn't necessary, or even particularly useful, to remember which items are which, but you may find it useful to remember simply that the distinction exists.

Here's what distinguishes a *tool* from a R.O.M.I.: you never have to select a tool twice in succession. When you select a tool, that tool stays in your hand until you select a different tool. You can select all the R.O.M.I.'s you like after selecting a tool and, when the dust clears, you'll still have your tool in hand, ready to go.

5.1 Project

New

This will erase the current drawing and reset the drawing region.

Open

This will open a drawing which exists on disk for viewing and/or editing. You will use the file requester to specify the file name and directory. Initially, IntroCAD expects drawings to be located in the directory "Intro-CAD:Drawings".

Save

This will save the drawing to disk using the current drawing name and directory. The current drawing name is either of:

1) The name of the drawing (if any) you opened for editing when you began the current IntroCAD session.

2) The name most recently used in the current IntroCAD session to save a drawing.

If there is no current drawing name, this menu item will behave exactly like SaveAS.

SaveAS

This will save the drawing you are working on to disk. the file requester will display itself and invite you to type a file name (in the "string gadget" at the bottom of the requester). Alternatively, you may click on one of the file names displayed if you want to over-write an existing file.

Plot
Screen Drawing

This will draw the current picture on a plotter. If you choose the "Screen" subitem, only the currently visible portion of the drawing will be plotted. Otherwise, the whole drawing will be

plotted. See "PRINTING & PLOTTING" below for more information.

Print Screen Drawing

This will print screen or drawing on a dot-matrix printer. If you choose the "Screen" subitem, only the visible portion of the drawing is plotted. Otherwise, the whole drawing is plotted. See "PRINTING & PLOTTING" below for more information.

About

This will bring up a requester which describes IntroCAD and gives the names of major contributors.

Quit

This will quit IntroCAD. If you have made any changes to the drawing, you will be asked if you want to save it. If you do, the file requester will display itself as if you had selected "Save AS" from this menu. (If you elect to save your drawing and anything goes wrong during the save operation, IntroCAD will NOT quit. You must either save successfully or elect not to save before IntroCAD will let you out.)

5.2 Part

Open (*tool*)

This will include an IntroCAD part (or drawing) which was previously saved to disk, in the current drawing. You will use the file requester to specify the part name and directory, just as you would to open a drawing.

Save (*tool*)

This will save an object to disk using the current part name and directory. The current part name is the name of the part most recently saved in the current IntroCAD session. If this is the first Part save in the session, there is no current part name, and this menu item will behave exactly like the "SaveAS" item in this menu.

Select the object you want to save (see "Selecting Objects") after making this menu selection.

SaveAs (*tool*)

This will save an object to disk by name. When you've selected the object to be saved (see "Selecting Objects"), the file requester will display itself and accept the file name.

Group (*tool*)

This will group objects together e.g., for treatment with an editing tool or to be saved as a "Part." Draw a box completely enclosing the objects you want treated as a group. An object can be in only one group at a time; if an enclosed object is already part of a group, the entire group will merge into the new group.

UnGroup (*tool*)

This will ungroup objects grouped with the "Group" tool. Select a group by clicking on any of its members. (See "Selecting Objects.") On the confirming ***SELECT*** click, the group will be dismembered into primitives.

5.3 Options

No selection from this menu will ever make a change to your drawing. Items in this menu may make the screen LOOK different, however, and some affect the way your drawing motions are interpreted by IntroCAD.

ReDraw
Now

This will redraw the screen immediately.

ReDraw
Auto

Tells IntroCAD to redraw the screen whenever it seems necessary.

Zoom (*tool*)

1) Draw a box around the region you want to see up close. IntroCAD will zoom in to the biggest region consistent with both the box you drew and the aspect ratio of the drawing.

2) Click twice in the same spot. IntroCAD will zoom out by a factor of two.

Slide (*tool*)

Draw a line. On your second ***SELECT*** click IntroCAD will redraw the picture as if your first click had grabbed hold of the page.

FullPict

This will cause IntroCAD to zoom out to show the whole drawing.

Rulers

This is a toggle switch that puts rulers on the display, or takes them away.

Grid

Choose the type of grid to be displayed behind your drawing.

Off

This will set the grid type to "Plain" (see below) and render it invisible. Also, it will disable the display of the grid spacing, which can normally be seen in the lower right-hand corner of the screen.

Note that this item does NOT disable snapping to the grid. That option is controlled by the "Snap to" item in this menu.

Plain

A "Plain" grid is a regular array of horizontal and vertical lines. The grid spacing will be displayed in the lower right-hand corner of the screen.

Projection 1

This is a "Plain" grid supplemented by lines at 30 degrees to the horizontal.

Projection 2

This is a "Plain" grid supplemented by lines at 60 degrees to the horizontal.

"Projection 1" and "Projection 2" are similar in use to the full isometric grids described below. They are isometric in only two of the three dimensions, but behave much more reasonably through "Zooming" and "Sliding" of the display region.

Isometric 30

Full isometric grid. See below.

Isometric 60

Full isometric grid.

"Isometric 30" and "Isometric 60" are fully isometric projections of a three dimensional grid. (All three dimensions are equally "fore-shortened.")

Since these grids are generated with transcendental functions, no possible linear scaling of the horizontal and vertical coordinates can cause the grid intersections to align exactly with the (discontinuous) array of pixels which is your computer screen. Since the alignment cannot be exact, the points of your drawing cannot lie on a grid intersection and, at the same time, be centered on a screen pixel. The misalignment only becomes visible, however, after you Zoom or Slide. IntroCAD makes no attempt to minimize the visible misalignment.

CrossHair

This is a toggle switch. When active, the mouse pointer will be replaced by a crosshair. (Notice what happens when you press the ***MENU*** button and move the mouse. You can still make menu selections, but the mouse pointer remains invisible during menu operations).

Snap to
Grid
Drawing

These are mutually exclusive toggle switches: "Grid" and "Drawing" cannot both be selected.

While "Snap to Grid" is selected, the mouse position used for drawing snaps to the nearest grid intersection. While "Snap to Drawing" is selected, newly drawn points which are within a few pixels of previously drawn points are snapped to them. This makes it possible to draw closed figures using the "Line" drawing tool.

The setting of this switch is also used by the editing tool "Snap," to determine what sort of snapping is to be done.

GridMesh
Finer
Coarser

This will change the density of grid lines by a factor of two. A minimum and a maximum density are enforced.

ShowXY

This will call up a numeric readout in the current plot color of the pointer position. The readout is in USER coordinates (the numbers which are drawn when you select "Rulers" are in USER coordinates). The readout consists of the absolute X (horizontal) and Y coordinates and the distances from the location of the most recent ***SELECT*** click.

ShowMem

This will toggle display of the total amount of free memory.

ShowTool

This will toggle display of the name of the currently active tool.

Mouse Speed
Faster >
Slower <

This will change the distance the pointer moves in response to a mouse movement. This item is just like the Preferences mouse-speed selection.

You can select these items WHILE you are drawing or editing an object. The keyboard substitute keys (right-Amiga | period, right-Amiga | comma) were chosen with this in mind, in fact; they are easily pressed with one hand. You shouldn't "stand" on these keys. If they repeat faster than the functions they invoke can be executed, then the display may "freeze" momentarily while the backlog is handled.

5.4 Draw

The items in this menu are all tools. Selecting a tool makes no immediate change to the drawing, but determines the manner in which subsequent mouse motions will be interpreted by IntroCAD. Since these tools do nothing by themselves, the instructions describe what YOU should do to use them.

Line (*tool*)

Draw a sequence of (one or more) connected lines. Click twice on your final point.

To draw a single line:

Position the mouse pointer where you want the line to begin. Click the left mouse button once. Move the mouse pointer until

the line you see is the line you want. Bring the mouse to rest. Click the left mouse button twice.

When drawing several connected lines, click once to end each line and begin the next. Click twice at the end of the final line.

Box (*tool*)

Draw a box by clicking on two opposite corners:

Position the pointer where you want one corner of the box to be. Click the left mouse button once. Move the mouse pointer until the box you see is the box you want. Click the left mouse button once.

Circle (*tool*)

Draw a circle by specifying the center and radius.

Position the pointer where you want the center of the circle to be. Click the left mouse button once. Move the pointer until the circle you see is the circle you want. Click the left mouse button once.

IntroCAD will not draw a circle of zero radius, and will ignore a sequence of mouse clicks which directs it to do so.

Arc (*tool*)

Draw an arc by specifying the center, radius/starting angle, and ending angle.

Position the pointer where you want the center of the arc to be. Click the left mouse button once. Move the pointer to set the radius and starting angle of the arc. Click the left mouse button once. Move the pointer until the arc you see is the arc you want. Click the left mouse button once.

IntroCAD will not draw an arc with zero radius of curvature, and will ignore a sequence of mouse clicks which directs it to do so.

Measure (*tool*)

Draw a line. On your second click, a requester will appear showing the length and angle of the line.

Clone (*tool*)

Select an object by clicking on any of its members. (See "Selecting Objects.") A duplicate will follow the mouse pointer until you press either the ***MENU*** button ("abort") or the ***SELECT*** button.

TextSize (*tool*)

Draw a box indicating the size/aspect of the letters you plan to type onto the screen.

Cursor (*tool*)

Select the location of the text cursor. Set the mouse pointer at the desired location and click the ***SELECT*** button.

5.5 Edit

In every case, you first select an object. (See "Selecting Objects" for a complete discussion of what it means to select an object and how to do it). These items are all tools.

Erase (*tool*)

Select an object to erase it. The DEL key, by the way, will erase the last primitive in the drawing list.

Size (*tool*)
Free
No Distort

Select an object. IntroCAD will draw the smallest enclosing rectangle (possibly a line) and will draw tiny boxes at the corners. Click on one of the tiny boxes to begin sizing the selected object. The object will be scaled as the mouse moves.

Press the ***SELECT*** button, when you like what you see, or the ***MENU*** button to abort. If you choose "Size/Free," you can change the "aspect" (ratio of width to height) of the object—changing a circle into an ellipse, for example. If you choose "Size/No Distort," the aspect of the object will not change as its size changes.

Move (*tool*)

Select an object. The object will follow the mouse pointer until you press either the ***MENU*** button ("abort") or the ***SELECT*** button.

Rotate (*tool*)

Select an object. The selected object will be rotated about its "center." (The X coordinate of the "center" of an object is equal to the average of the X coordinates of all the object's points).

Variable

Vary the rotation angle by moving the mouse. When the mouse pointer is "due east" (to the right) of the object's center, the rotation angle is zero. Click ***SELECT*** to finish or ***MENU*** to abort.

90 Deg.

If you choose "90 Deg." then the object will be rotated counter-clockwise by 90 degrees. (No chance for abort with the "90 Deg." selection since it takes effect immediately upon selection of an object).

Point (*tool*)

The highlighted object will have tiny boxes drawn at each of its points. Click on the point you would like to move. The point, and lines connecting it to adjacent points—will follow the mouse. Click ***SELECT*** to finish or ***MENU*** to abort.

Color (*tool*)

The selected object will immediately turn to the current plot color. (No chance for abort here).

SetLinTyp (*tool*)

The selected object will be re-rendered in the current line type. (No chance for abort here).

Snap (*tool*)

See "Snapping" for a general orientation to this feature.

Naively

Select an object. The object will be snapped to the grid or drawing depending on the setting of the "Options" menu item "Snap to." This is a dangerous tool!

No Distort

The highlighted object will have tiny boxes drawn at each of its points. Select the point to be snapped to the grid. The object will move as a whole so that the selected point is snapped. (You can't use this tool if "Snap to Drawing" is active).

5.6 Colors

None of these menu items are tools.

Color boxes

Your menu selection will become the current plot color. Initially, the current color is #4 (first box in second row of the palette).

Modify Colors

This will call up the palette tool, which is used to change the screen colors.

Save Colors

This will save the current colors to the file "Intro-CAD.rgb" which is read by IntroCAD on startup.

5.7 Line Type

Your menu selection will become the "current line type." All drawing is done using the current line type except drawing of text. Text is rendered in solid lines regardless of the current line type, but you can use the editing function "SetLinTyp" on text as well as any other object.

None of these menu items are tools.

6.0 Hints, Suggestions...

6.1 Fine control of the mouse

For very fine work with the pointer, and for moving the pointer horizontally or vertically, use the Amiga-arrow keys (LeftAmiga-arrow.) You may have forgotten about this keyboard alternative since it is so rarely useful. Also, don't forget about Amiga-alt for mouse buttons.

6.2 Screen to back/front

You can bring the Workbench screen to the front by pressing Left Amiga-N and send it back to the back with Left Amiga-M. Surprising how many folks have forgotten this and other handy features of Intuition.

6.3 Grouping objects

Since the only way to indicate which objects you want in your group is to draw an enclosing rectangle, you may be having trouble getting just the objects you want. You don't have to enclose all the desired objects at once, however. Two or more rectangles can be used. If you group objects which already are parts of separate groups, then the separate groups will be merged into one.

6.4 Text Size

To keep a constant text size in your drawing through many edits, or from drawing to drawing, you might consider making a box of the desired text size and saving it as a part called "textsize." When you want to set your text size, then: open the "textsize" part; select "TextSize" from the "Draw" menu; and draw a box exactly like the "textsize" box.

Here is an easy way to reproducibly set text sizes with pleasing aspect ratios: Select "Snap to Grid" with a "Plain" grid type. Select "TextSize" and draw a rectangle two boxes high by one box wide. (You will probably have to Zoom in so that you can set a fine enough grid mesh to get a reasonably small text size with this method).

6.5 Memory

If you select "Open" or "SaveAs" and nothing happens, you may be low on memory. The file requester may not be able to allocate enough memory to display itself. IntroCAD will have no idea what has happened. It receives the same message as it would if you had selected the requester's "Cancel" gadget. The only way to save under this circumstance is to select "Save" from the Project menu. (If you select "SaveAs" from the "Part" menu, remember that nothing will happen in any case until you select the object to be saved).

7.0 Printing and Plotting

7.1 Printing

IntroCAD doesn't print graphics the way most other Amiga programs do. IntroCAD doesn't use the PRT: device or the Amiga printer drivers. This means that IntroCAD completely ignores the Preferences settings which have to do with printing. There is a good reason for this.

The Preferences printer drivers do a beautiful job of rendering an image of the Amiga screen on a printer. This job, however, doesn't require the drivers to use the best possible resolution of the printers they control, simply because printers generally have much better graphics resolution than computer screens—even Amiga computer screens. The Preferences printer drivers do not contain the information IntroCAD needs to use printers to their best advantage.

When IntroCAD prints a drawing, it doesn't "dump" the image you see on the screen to a printer. Instead, it draws a new image with the resolution you select, and dumps *that*. You'll notice that the rulers, grid, and other features which appear on the screen do not appear in the new image.

IntroCAD can print drawings on a graphics-capable printer if it can find the "printer definition" file which describes that printer. These "printer definition" are not the same as "printer drivers" and don't even remotely resemble them. No program other than IntroCAD uses these files.

A number of "printer definition" files are included on the IntroCAD disk in the subdirectory "PrtDef". Very likely, one of these files describes your printer. You should erase all the others from your WORKING COPY of the IntroCAD disk, so that you don't have to weed through them all every time you want to print a drawing. It will be most convenient for you to rename the file which describes your printer as "DEFAULT_PRINTER" since this is the file IntroCAD initially assumes.

If there isn't a file with the same name as your printer, look at the file "exact" which appears in the PrtDef directory. This file is a list of printers which are equivalent, at least for IntroCAD's purposes, to printers for which a printer definition file has been written.

When you tell IntroCAD to print a drawing, it goes to the directory "Intro-CAD:PrtDef" calls up The file requester, and invites you to select a printer definition file. If the file you select is a valid printer definition file, a requester will be displayed from which you can choose several printing options:

1) print resolution:

As you might expect, there is a trade-off between quality and speed. "QUICK" produces the fastest printout; "FINAL" produces the best print quality; and "DRAFT" produces the best compromise between "QUICK" and "FINAL." For a few printers there is a fourth resolution, "GOOD," which is between "DRAFT" and "FINAL" in quality.

2) orientation:

"Portrait" produces a drawing oriented the same way as the letters your printer prints. "Landscape" produces a drawing that sits "sideways" on the page.

3) scale:

If you choose "1:1" here, the drawing will be printed to scale. (IntroCAD dimensions are in inches). If the drawing will not fit on the page, it will be clipped.

"Fill Page" will cause the drawing to be scaled so that it just fits on a page. The aspect of the drawing will not be changed in the scaling.

4) destination:

This is the "device" to which the printing will be done. Normally, you will choose "PAR:" or "SER:", depending on which device your printer is connected to. (Most printers are connected to PAR:)

Alternatively, you can direct the printout to a file. It's hard to think of a reason for doing this, but the capability is there should you need it. Use this feature only if you have LOTS of disk space, because the resulting file will be huge. To print to a file, select "file" and type a filename into the string gadget at the bottom of the requester.

5) color:

"B&W" produces a drawing in which all lines are black (colors are not mapped to varying shades of gray). "Color" produces a drawing in which the Amiga colors are mapped to the colors supported by the printer.

IntroCAD makes no attempt to reconcile the Amiga screen colors with the your printer's colors. You should set your IntroCAD palette so that some of them agree with the colors your printer can produce.

If the printer definition file you selected contains no instructions about color printing, the "Color" gadget will be "ghosted," and you will not be able to select it.

7.2 Plotting

IntroCAD can produce drawings on plotter if it can find the "plotter definition" file which describes that plotter. A number of such files are included on the IntroCAD disk (in the subdirectory "PltDef").

The process of plotting a drawing is very similar, from a user's point of view, to that of printing one. Some of the plotting options are different, however:

1) Orientation:

The orientation actually plotted depends on the plotter.

2) Scale:

same as printing.

3) Destination: same as printing.

4) # Pens

If you select "Many," IntroCAD will assume the plotter can correctly handle pen-color requests without help from you. If you select "One," IntroCAD will ask you to change pens manually.

8.0 Credits

Justin McCormick, the author of PIXmate, for the use of the incredible Pathmaster file requester and Spectra Plus Palette tool and also for a great deal of help with the title screen, IDCMP handling and the WorkBench.

Carolyn Scheppner for describing the right way to do things no other source of documentation even mentions.

Fred Fish for maintaining a library of freely distributable Amiga software.

9.0 Additional Features and Hints

An additional feature was added to the IntroCAD program after the manual was completed in November of 1987. This feature is described below, along with an additional hint we wanted to share with you.

9.1 Additional Features

FREEHAND: Different from all the others in that you hold the mouse button down while you draw.

FreeHand (*tool*)

Draw a freehand figure while holding the left mouse button down. Position the mouse pointer where you want the figure to begin. Press and hold the left mouse button. Move the mouse pointer to draw the figure. Release the left mouse button. You can abort while drawing a figure by pressing the right mouse button (without first releasing the left button).

While the mouse is moving, you are drawing points at a rate of about ten per second with this tool. While the mouse is at rest, however, no points are added to the drawing list. So you needn't feel that you have to draw a figure in one smooth motion to avoid wasting memory space.

You may find the "Options" menu item "MouseSpeed" particularly useful in combination with freehand drawing.

9.2 Additional Hints

Placing a drawing on the printer/plotter page:

Objects drawn in color 0 (the screen background color) are not printed or plotted by IntroCAD. They ARE included however in scaling and fitting a drawing to the screen and to the printer or plotter page. This can be very handy for combining IntroCAD output with, for example, the output of a word processing program. Here's how you might use this feature:

1) Using your favorite word processor or text editor, format a page of text—leaving space for the drawing(s) you want to include on that page. Print a copy of the page out.

2) Open the drawing you want to place on a page and "Group" the entire drawing so you can scale it as one object.

3) Draw a page-sized box (normally 8 inches by 10 inches). Using "Move and "Size/No Distort" from the "Edit" menu, locate the drawing within the rectangle. Refer to the printed page of text for exact placement.

4) Change the color of the box to color 0. (The box will no longer be visible on the screen.)

5) Select "Print/Drawing" from the "Project" menu. When the printer requester comes up, select "Fill Page" scaling. Before you start printing, put the page of text you printed earlier back in the printer so Intro-CAD can fill in the spaces you left.

This is not the easiest way to mix text and graphics, clearly. This is actually a way to produce an astonishingly nice piece of work with Intro-CAD, a medium-priced printer, and a simple text editor.

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